Infrastructure Development and Its Effects on Transport, Demography and Employment: the Example of a New Rail Line Dresden-Prague

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11 INFRASTRUCTURE DEVELOPMENT AND ITS EFFECTS ON TRANSPORT, DEMOGRAPHY AND EMPLOYMENT: THE EXAMPLE OF A NEW RAIL LINE DRESDEN–PRAGUE

Resume

Abstract
This report describes the relation between the core network corridor Orient/East-Med and the elimination of one serious bottleneck with the example of the planned new railway line Dresden–Prague. In cooperation between the Free State of Saxony and the Czech Republic first preplanning studies were elaborated for a new cross border track, which will bring the regions closer together and has positive effects for a modal shift to rail as well as for the regional economy and development.

The basis of this report are results of the study for the new line from 2015. An incorporation of interim new proposals for a route guidance has not been made due to the lack of depth of investigation of these alternatives at the moment.

Keywords
Trans-European Transport Network – Orient/East-Med Corridor – Free State of Saxony – Czech Republic – European Grouping on Territorial Cooperation

Infrastrukturentwicklung und ihre Auswirkungen auf Verkehr, Demographie und Beschäftigung: Das Beispiel einer neuen Eisenbahnstrecke Dresden–Prag

Kurzfassung
Der Beitrag verdeutlicht den Zusammenhang zwischen dem Kernnetzkorridor Orient/East-Med und der Beseitigung eines gravierenden Engpasses am Beispiel der geplanten neuen Eisenbahnstrecke Dresden–Prag. In Zusammenarbeit des Freistaates Sachsen und der Tschechischen Republik wurden erste Vorplanungsstudien für eine neue grenzüberschreitende Strecke erarbeitet, die die Regionen näher zusammenbringt und positive Auswirkungen auf eine Verkehrsverlagerung auf die Schiene sowie auf die regionale Wirtschaft und Entwicklung hat.

Grundlage dieses Beitrags sind die Ergebnisse der Studie für die neue Linie von 2015. Zwischenzeitlich neu vorgeschlagene Routenführungen wurden nicht aufgenommen, da diese Alternativen bislang nicht gründlich genug geprüft werden konnten.

Schlüsselwörter
Transeuropäisches Verkehrsnetz – Orient/East-Med Corridor – Freistaat Sachsen – Tschechische Republik– Europäischer Verbund für territoriale Zusammenarbeit

1 The rail line Dresden–Prague – a bottleneck on the Orient/East-Med Corridor

Good infrastructure for passenger and freight transport in all modes is a precondition for economic growth and development in the EU countries and their neighbors.
In the European revision process of the Transport Network (TEN-T) the EU Commission launched its own study for each of the nine multimodal Transport Core Network Corridors including the Orient-East/Med Corridor (OEM). Within the study of OEM several bottlenecks have been identified. A key bottleneck of the OEM Corridor is the rail line Dresden–Prague along the valley of the river Elbe (EC 2014). In the cross-border section between the towns Pirna (DE) and Děčín (CZ) this line is double tracked, but heavily used by local and long distance passenger transport as well as a constantly growing number of freight trains. Figure 1 shows the existing line along the Elbe river (black and white dashed) and the new cross border section (red and white dashed).

In 2016, the capacity utilization of this section reached a level of more than 82%, the second most frequently used rail freight border crossing in Germany (see Fig. 2).

Because of the curved route, especially on the German side, travel speed varies between 80 and 120 km/h. An upgrade is not possible, because the river valley is too narrow. The Saxon-Bohemia region is an important natural reserve and an area of tourism.

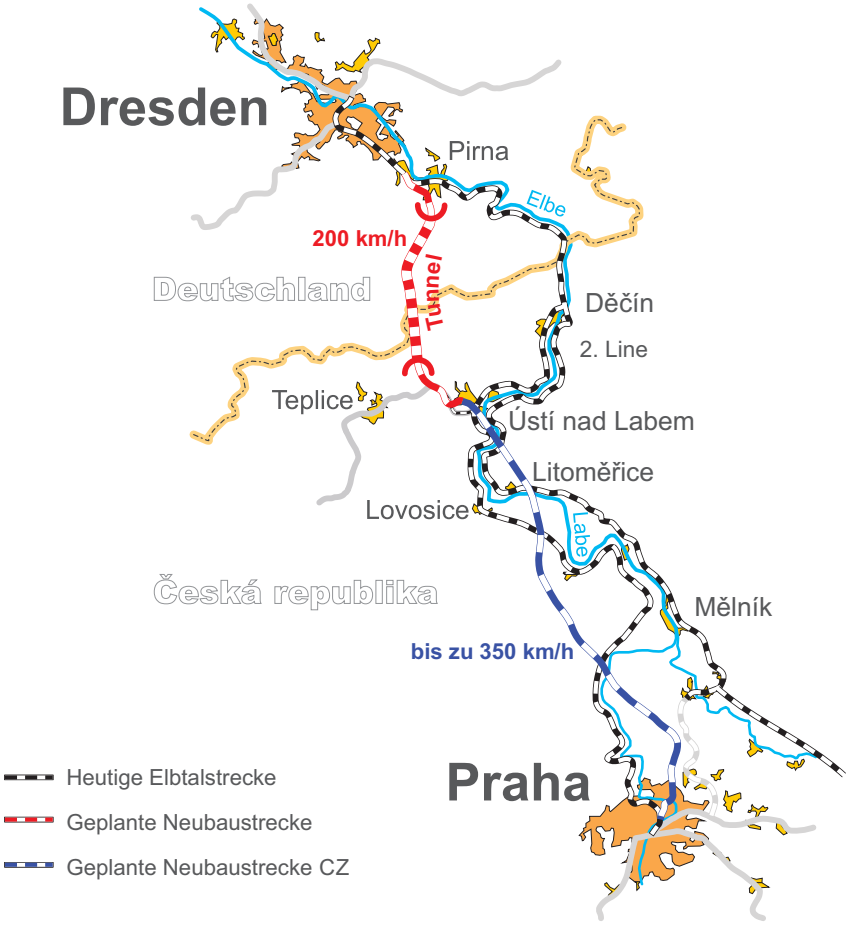

Fig. 1: Dresden–Prague route / Source: SMWA 2015

The common main objectives for a new route are:

> Reduction of travel time for long-distance passenger transport

> Increase of capacity for freight transport

> Reduction of noise pollution in the Elbe valley by shifting most of the freight trains to the new line

> Provision of a flood-safe connection to the Czech Republic

To remove the bottleneck between Saxony and the Czech Republic a Preliminary Planning Study for this new railway line link was launched in 2014 (SMWA 2015).

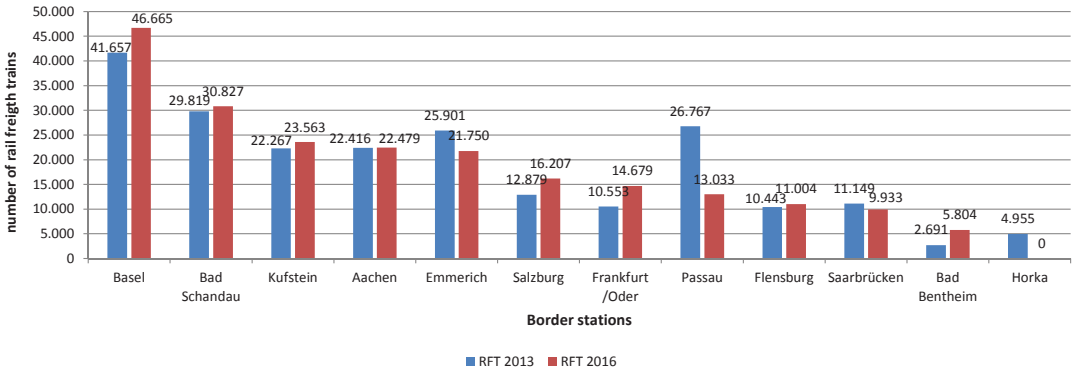

Fig. 2: Annual development of the number of border crossings by freight trains at the German border stations / Source: DB Netz AG 2017

This article gives an overview of the cooperation between German and Czech partners to elaborate a solution for the rail connection between Dresden and Prague. The common aim of the cooperation was to find an alternative route outside the Elbe valley under consideration of the technical requirements of the EU and the aspects of regional development.

2 Preliminary Planning Study for a new railway line Dresden–Prague

The Preliminary Planning Study 2015 was jointly prepared by the Saxon Ministry for Economic Affairs, Labor and Transport (SMWA), the Czech Ministry of Transport (CZ MoT), several German and Czech planning companies and both infrastructure managers, the Deutsche Bahn Netz AG (DB Netz) and Správa Železníční dopravni Cesty (SŽDC) as well as other specialists. This study was the basis of the cost-benefit-analysis by the Federal Ministry of Transport and Digital Infrastructure (BMVI) in Germany as a precondition for the inclusion of the project in the German Federal Transport Infrastructure Plan 2030 (BVWP). The EU Commission co-financed this study with 50%.

2.1 Technical and public law

The technical and public law was compared and relevant technical regulations were listed. Under the Technical Specification of Interoperability (TSI) on the German side, plenty of additional regulations exist for high speed lines. All of them are compliant to EU law. In contrast to Germany, no such regulations exist on the Czech side, since no high speed line is in operation here yet. For the preliminary study, therefore the decision was made to follow the German rules for infrastructure parameters.

In public law differences exist between both sides of the border (see Fig. 3). A separate working group was formed to tackle this task. “The public planning procedures in Germany can be structured in a ‘National Transport Planning’ period with first pre-fea-

sibility studies, a subsequent 'regional assessment period' and ending with the building permission" (SMWA 2015, task 1.2.2). While "the legal planning procedures in the Czech Republic are structured in a 'Pre-investment period' starting from the first pre-feasibility study and ending with the regional assessment, and a subsequent 'Investment period' ending with the building permission" (SMWA 2015, task 1.2.1).

The knowledge of these differences is important for the further preparation of the project and the necessary planning steps.

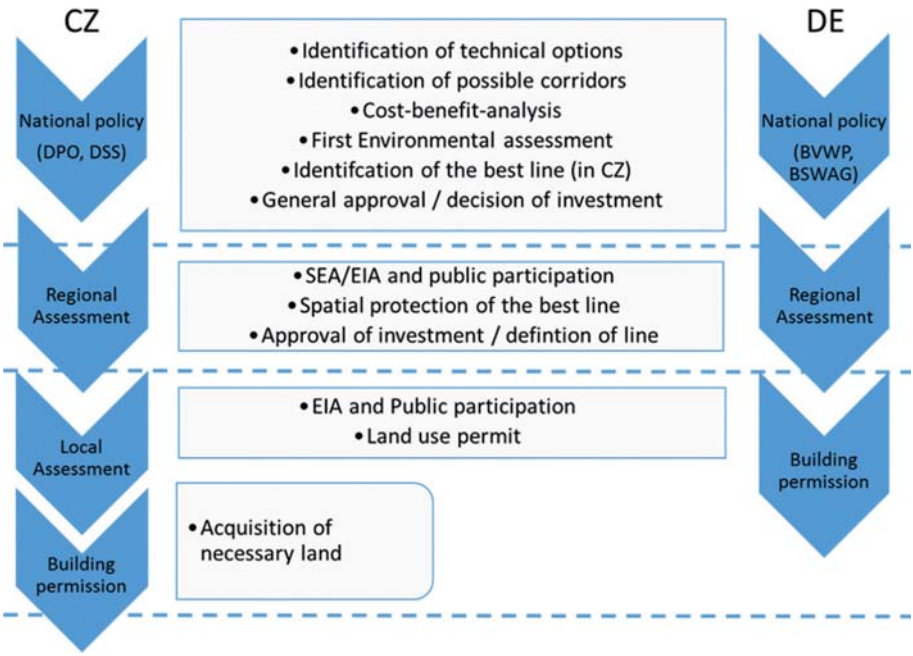

Fig. 3: Comparison of public law / Source: SMWA 2015

2.2 Optimization of the route alignment

The second and main point of the study was an update of the alignment of the route considering several aspects on the German side. All existing alternatives outside the Elbe valley have to cross the Ore Mountains as a natural border between Saxony and the Czech Republic with a long tunnel. Therefore, an investigation of the geology as well as environmental evaluation was included under that point. The aim was to minimize the impact of the route on the environment and settlements under consideration of geophysical, hydrological and technical requirements.

The new line will leave the Elbe valley from the town Heidenau in the southeast of Dresden. The maximum slope – considering the requirements of rail freight – is limited to 12‰ behind the turnout point. After two short tunnel sections a long bridge over

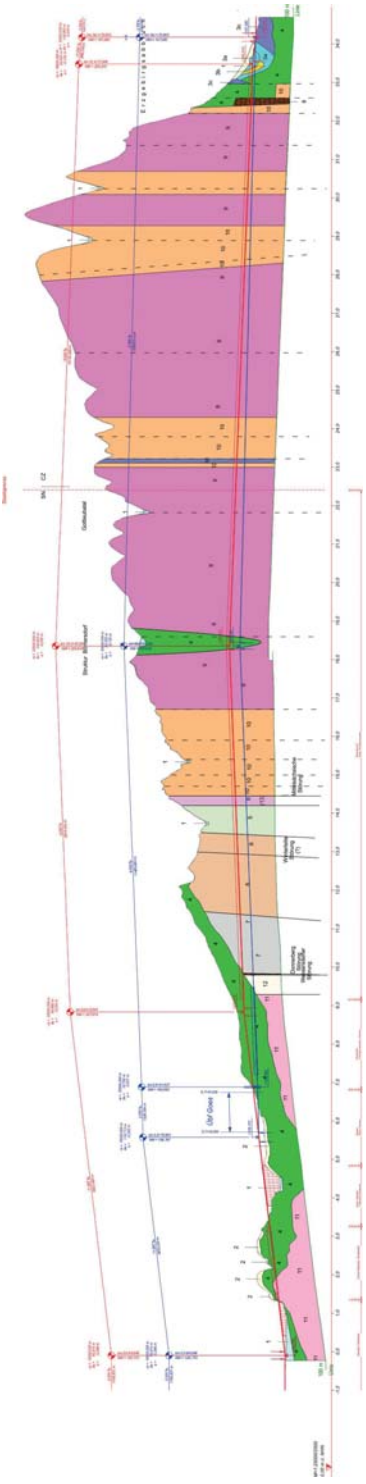

Fig. 4: Longitudinal Section – cross border tunnel / Source: SMWA 2015

the Seidewitz valley with a length of around 1040 m and a height of 40 m above ground level follows.

Between the bridge over the Seidewitz valley and the northern portal of the base tunnel an overtaking station with four parallel tracks is included to fulfill the requirements of DB regulation 413 (DB Netz AG n.y.). This station allows the track-switching of slower trains or a stop in case of emergency. Then the approximately 26.5-km-long base tunnel begins, designed as a twin tube tunnel which allows the operation of mixed traffic.

The excavation volume will be approximately 4.8 bn m³. Most of this volume can be used for re-cultivation of quarries, site setups and landscaping along the open areas of the line.

On the Czech side several alternatives for the routing to Ústí nad Labem as the first stop and then to Prague were investigated. There are two variants from the border to Ústí nad Labem and three from Ústí to Roudnice nad Labem under discussion (see Fig. 5).

The continuation of the new rail line from the German-Czech border is planned in three sections (border–Ústí nad Labem; Ústí nad Labem–Roudnice nad Labem and Roudnice nad Labem–Prague) on the Czech side.

While the first section to Ústí nad Labem will be designed for mixed traffic (passenger and freight trains) and a speed of 200–230 km/h, the continuation to Prague will be used for passenger trains only. This is possible because on the Czech side there are two tracks each left and right of the River Labe which can be used for freight trains.

In 2019 the final route solution shall be now confirmed on the basis of a feasibility study for the new railway line (SŽDC 2017), which started in spring 2017 on the Czech side. As

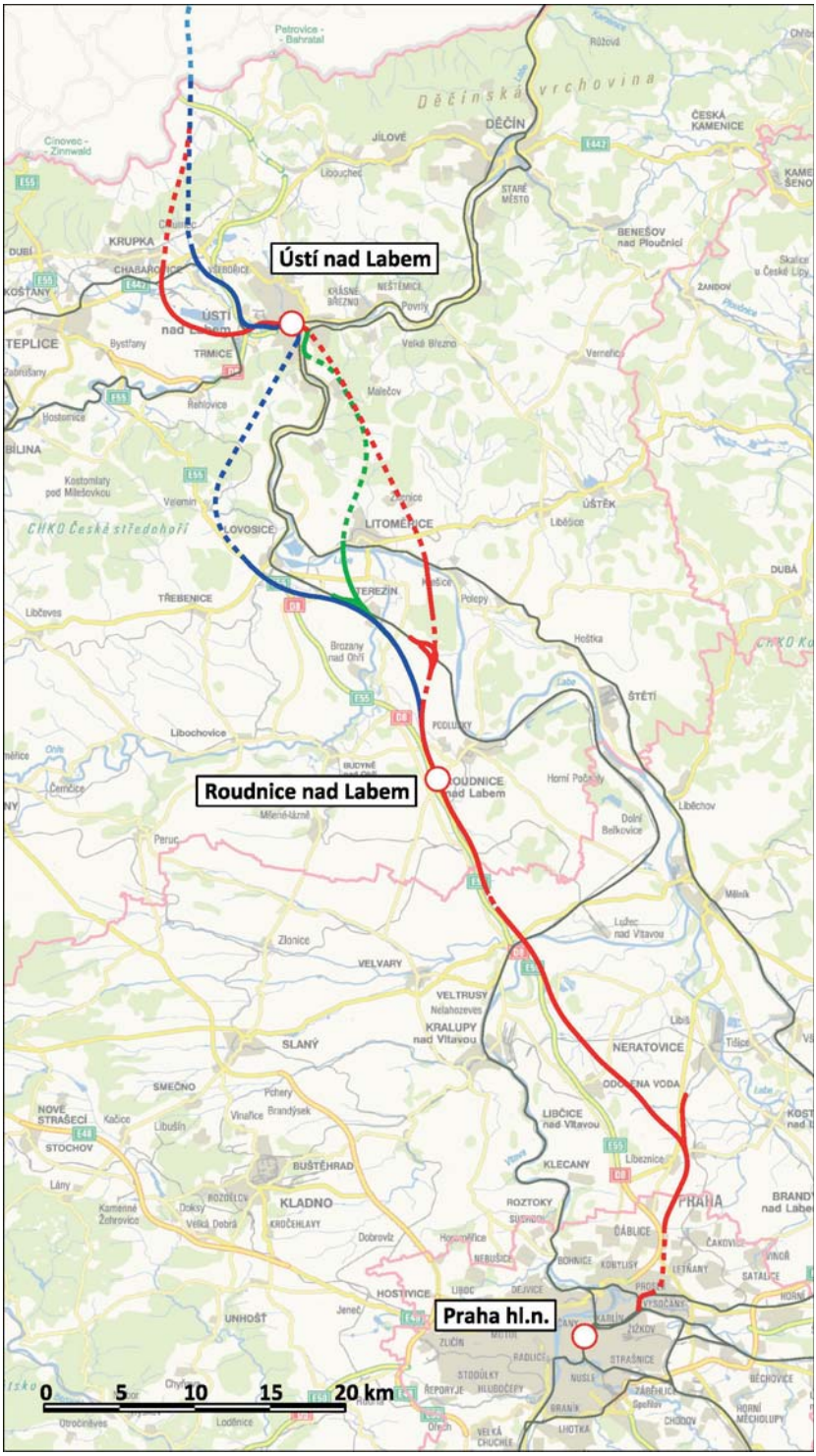

Fig. 5: Czech variants / Source: MOT 2016

a result of this feasibility study, a decision will be taken as to which routing and speed will be the most favorable on the Czech side and where the separation point of passenger and freight trains will be – in Ústí nad Labem or more to the south e.g. in Litoměřice.

Each variant between Ústí nad Labem–Roudnice nad Labem includes an approx. 15-km-long tunnel beneath the České Středohoří mountains. The rail line for the last section to Prague will be parallel to the D8 motorway.

2.3 Operational concept

The German infrastructure manager DB Netz AG elaborated a timetable study, which took into account the capacity of the nearest nodes on each side of the border as well as the expected future operational concept with: (DB Netz AG 2015)

> additional international freight trains according to confirmed forecasts,

> hourly frequency of long-distance passenger trains with a maximum speed of 230km/h instead of 2-hour frequency with a speed of 80–120km/h and

> a new regional express train to serve the communities along the Elbe valley.

Since summer 2018 the infrastructure managers of Germany and the Czech Republic have coordinated more exactly the future numbers of trains as a precondition for the preplanning phase. In this context an additional regional short distant train on the new line is planned to Tepliče and Most.

The planning study also considered **main infrastructure elements** like bridges and tunnel design and a possible **time and cost frame** for planning and construction was also discussed. Most of the documents of the 2015 study are published under www.nbs-dresden-prag.eu.

3 Effects of the new line

The new route will bring significant benefits under several aspects. With the new line the regions will come closer together. This provides opportunities for the inhabitants of the regions on both sides of the border e.g. in commuter transport, education, tourism and trade.

3.1 Transport impacts

The new line will double the capacity for long-distance passenger trains at high speed from eight trains per direction to 16 and will cut travel time from more than 2 hours to less than 1 hour between Dresden and Prague. Between Dresden and Ůsti nad Labem as the first stop on the Czech side, travel times will be cut from 60 minutes to 25 minutes. Most of the freight trains will be shifted from the Elbe valley to the new route. Only very long or heavy trains will remain in the Elbe valley.

With shifting the central station for the new rail line from the outskirts of Ústí nad Labem close to its city center, the attractiveness of public transport access to the downtown will be simplified. The new railway line ensures the position of the border region, being one of the main transit axes for international goods flows (e.g. containers, agricultural goods and new cars) between southeast Europe and the North and Baltic Sea ports. The freight villages, inland ports and intermodal terminals on both sides of the border which are connected to this axis will benefit from the long-term strengthening of this section of the OEM Corridor. Not least, with this new link a serious bottleneck will be removed from the OEM Corridor.

Fig. 6: Variant of the Seidewitz valley bridge / Source: Vectorvision 2015

With the new railway line, the risk of interrupted train service due to floods along the Elbe river can be avoided. For example, in August 2002 and June 2013 the Elbe valley was massively affected by floods. For several weeks in 2002, the railway line between Pirna and the border was closed, because the Elbe flood led to significant dam damage and the additional destruction of the electronic track control system (ESTW) in Pirna. Even after the line was opened again, it could be used for months only with restrictions, especially in international traffic from Dresden to Prague. The flood in June 2013 also caused enormous damage. Rails, bridges and roads were damaged and partially closed. The traffic in the Elbe valley was again restricted. Also the traction power supply and train protection systems were out of operation because of the flood, which led to massive delays. The section prone to flood risk will be bypassed by the new railway line.

Due to the available time till the beginning of the construction work it is planned to launch e.g. an architectural competition for the long valley bridge and maybe for the tunnel portals, leading to the better integration of these structures into the landscape.

3.2 Environmental impacts

The Elbe valley is polluted by rail traffic and noise from the existing rail line (see Fig. 7). The valley is narrow and densely populated, especially on the Saxon side.

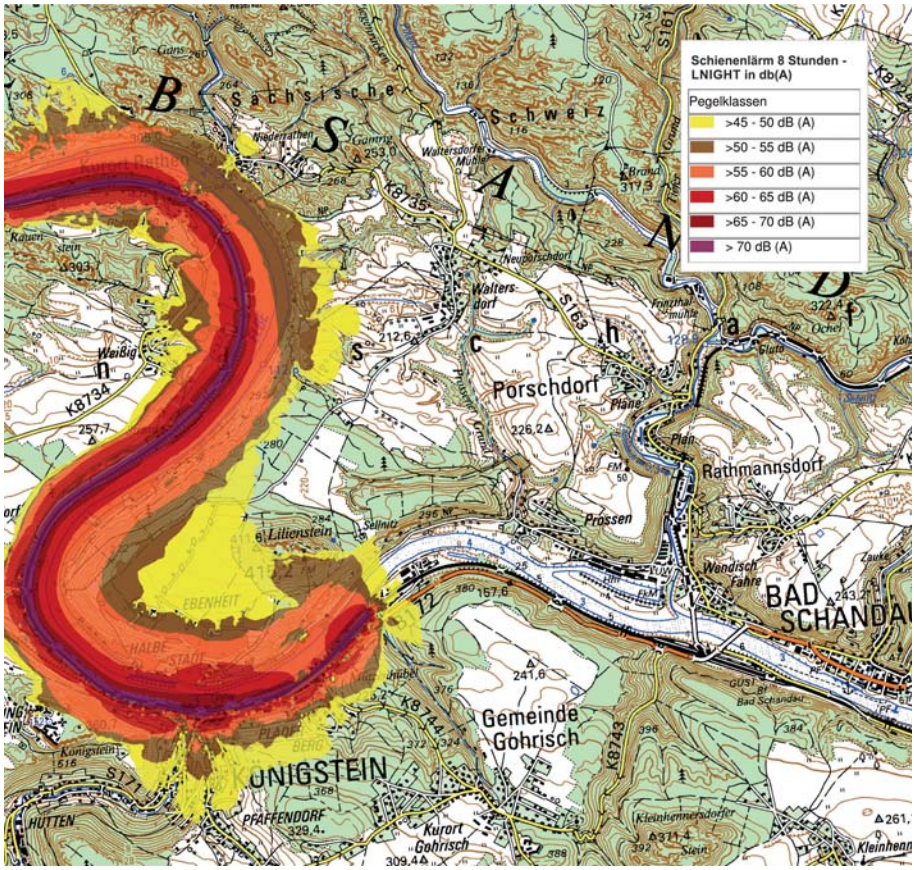

Fig. 7: Noise levels along the railway line in the Elbe valley in the Königstein section / Source: EBA 2010

The new route is dominated by a base tunnel. As a result noise pollution will be reduced significantly in the Elbe region and Saxon Switzerland, which are not only important tourist areas but in parts even a national park.

According to Environmental Impact Assessment Analysis (§2 UVPG) the defined term 'environment' contains the following aspects of environmentally designated issues:

> humans including human health, fauna, flora and biological diversity,

> soil, hydrology, air, climate and landscape,

> cultural and material aspects,

> and the interaction between the above-named aspects of environment (SMWA 2015, task 2.1.1.3).

"The summarizing assessments of the spatial resistance analysis regarding the aspects of environment have shown at least medium spatial resistances with partial overlays. In the southern part of the investigation area where overlaps by medium and high spatial resistances appear, the technically required tunnel solution strongly relativizes the expected conflict intensity" (SMWA 2015, task 2.1.2.5).

Based on the preliminary study, the German part of the new route is approximately 22 km long. Only about 5 km are routed along the surface. The objective for the next planning phase is to minimize the environmental impact of these sections by further optimization.

Due to modal shift from road to rail, the new railway line also has effects on transport-related energy consumption and greenhouse gas emissions (GHG), both due to the shorter rail connection and to the modal shift from road to rail. However, changes apply mainly to long-distance passenger and freight transport. Regional passenger transport will not be subject to significant changes as it will continue to operate mainly on the existing railway line. According to the calculations of the study, about 1,000 tons of GHG emissions (CO2 equivalent) will be saved in long-distance passenger transport and more than 20,000 tons in freight transport. As far as air pollutants (SO2, CO, NOX, and PM) are concerned, the calculated reduction in long distance passenger transport amounts to 7.5 tons per year and to 57 tons per year in freight transport. The study also monetarized the mentioned external effects. According to these calculations, nearly 3 million EUR can be saved due to the reduced GHG emissions and air pollutants in every operational year (SMWA 2014).

3.3 Economy and labor market impacts

In economic figures, the cross-border section of the new railway line will involve a total investment of approximately 2.3 bn EUR with 1.3 bn EUR on the German and 1 bn EUR on the Czech side (SMWA 2015). First indications of the macroeconomic and socio-economic effects of this infrastructure investment can be taken from a study conducted by ProgTrans AG/LUB Consulting GmbH in 2014 (SMWA 2014). This study was carried out on behalf of the Free State of Saxony, thus only the impact in the Free State of Saxony was investigated. Currently the results of this study are being updated and harmonized with socio-economic effects on the Czech side as part of a cross-border INTERREG VA-research project. It will be finalized by the end of 2019/beginning 2020. This project involves beside Saxony the region Ústí nad Labem and includes interviews of inhabitants.

For this study, a completion of the cross-border section by 2035 with a total construction period of 8 years was assumed (after about 10 years for detailed planning and approval procedures). During this period the construction project is expected to create

about 8,700 fulltime jobs on the Saxon side (Haller 2005) in total, with an average of 1,000 full time jobs per year in Saxony. These jobs will also generate induced (secondary) employment. Based on empirical data, the induced employment can be estimated by multiplying the additional full time jobs by 1.25 up to 1.30. Accordingly, another 1,250 to 1,300 jobs can be expected per year. This factor corresponds with other analyses e.g. for a rail project in Baden-Württemberg (IWW Karlsruhe/TU Wien 2009).

At the moment the construction method of the tunnel has not yet been decided upon. If using mechanized tunneling, an area of at least 50,000 m² is required for construction site equipment for such a long tunnel in comparable projects. This area is designated as an industrial site close to the northern portal and the small town Dohma. Due to its formal designation for industrial use it can be used for the tunnel construction and afterwards as an industrial site, initiating additional employment in the region in the long term.

Additional effects from the operational phase relate to improved accessibility, in particular in the surroundings of the stations Dresden, Ústí nad Labem and Prague. In addition to the provision of sufficient capacity for current and future passenger and freight flows, the main effects are to be expected in the following fields:

> Changes in commuter flows and the regional labor market

> Establishment of new and extension of existing companies

> Improvements for regional tourism

> Changes in tax revenues

> Energy savings, reduction of GHG emissions and air pollutants

As far as commuters are concerned, travel times of about 20 minutes from Dresden to Ústí nad Labem and 1 hour to Prague provide new opportunities for the cross-border labor market, in particular from the Czech to the Saxon side. However, for the implementation of these effects, some of the following preconditions need to be fulfilled:

> Significant increase in demand for higher qualified employees in the Dresden region (good perspectives due to new major investments and high industrial diversification in the growing conurbation)

> Significant differences in living expenses on each side of the border, making commuting between place of residence and place of job attractive (higher relevance for Ústí region than for Prague)

> Differences in the labour market (demand and offer) on each side of the border (currently comparatively high unemployment rate in Ŭstí region)

> Attractive passenger train pricing for commuters

Taxwise, according to the findings of the 2014 study, the construction of the German part of the new railway line will generate additional tax revenues of about 340 million EUR. This tax revenue estimation spreads over the construction period and 2 years beyond.

3.4 Industrial settlement impacts

Between Saxony and the Czech Republic various and intensive economic relations exist. However, compared to other (western) European border regions, there is growth potential to be developed also in the course of the implementation of the new railway line. The conurbations of Prague and Dresden have already reached a significant level of settled manufacturing and trade companies with international, i.e. also cross-border orientation. Dresden is a high technology location of microelectronics, nanotechnology, biotechnology, pharmaceutical and automotive industry. In these industries accessibility is an important issue, e.g. when it comes to the accessibility of other production sites of the same company group. Therefore these companies and in future newly established enterprises will benefit from a more frequent and faster connection to Prague airport with its multitude of international flight connections.

Even if such effects cannot simply be monetarized, the new railway line is expected to have at least a 'soft' effect on decision processes concerning the establishment of new companies and related employment along the axis Dresden–Ustí nad Labem–Prague.

In particular for companies with a high transport and logistics intensity, a settlement close to one of the nodal points of the new rail route is attractive due to the additional capacity compared to the current bottleneck situation. An interregional industrial estate of about 140 hectares is planned by the region in the next couple of years close to the town of Pirna. It shall become attractive for big companies due to its proximity to the new rail line and the freeway A17 to the Czech Republic as well as to the Saxon capital Dresden.

3.5 Tourism impacts

The tourism industry, especially day-trip tourism, will benefit from the construction of the new railway line. In Saxony the related economic effects focus mainly on Dresden. The motives of day-trip visitors include both shopping and touristic offers. Recent years have shown that Dresden is becoming increasingly attractive for day trips to tourists who stay in Prague. The reduced travel time by train will support this development. The study expects vice-versa an increased number of travelers from Saxony to Prague.

Further potential is expected for Saxon tourists travelling to the tourist region of 'Bohemian Switzerland' via Ústí nad Labem. Nevertheless, the far more positive effect will be measurable on the other side of the border in the 'Saxony Switzerland' region: the shift of the majority of the freight trains from this region in the Elbe valley to the new

base tunnel will reduce noise disturbance in the hotels and tourist attractions along the Elbe valley significantly. This will open up completely new perspectives for marketing.

In addition to the effects of noise reduction on the tourism industry in the Elbe valley, also about 70,000 residents who are currently affected by rail noise along the existing line will benefit from the tremendously lower noise level.

4 Further implementation schedule

Under consideration of the differences in public law in both countries and the status of development, the current time frame is as follows:

On the German side the project is included in the Federal Transport Infrastructure Plan BVWP (BMVI 2017). The preplanning phase will start in 2019/20. Therefore cross-border working groups will be established. The first working group has been active since the beginning of 2018. Currently the Czech Republic is elaborating a feasibility study, which will be finished at the end of 2019. This is the basis for the next formal steps according to public law in the Czech Republic.

In May 2018 the BMVI and CZ MoT agreed to the project in a kick-off meeting. There is agreement between both sides that the planning for the cross border tunnel will be done by DB Netz AG in cooperation with the Czech side.

At the end of 2019 the regional planning procedure will start on the German side.

A trilateral agreement between DE-CZ-AT for the development of the rail connection Berlin-Prague-Vienna is under preparation for signature. This will be followed by a bilateral treaty for the cross border section later on. The planning phase is estimated to take at least 10 years. Thus, the start of construction work is feasible at the end of the next decade (2028/29) with the test phase to begin around 2035/36.

5 Initiative of the Free State of Saxony

In Germany rail infrastructure is the responsibility of the federal BMVI. The admission for the planning and financing of rail projects of national importance is regulated on the basis of the Federal Transport Infrastructure Plan. Since the new line also has great importance for transport and regional planning in Saxony, the Free State of Saxony started the initiative and launched several studies within the last 10 years. From the beginning of this process on, from a Saxon perspective the goal to be achieved was to find the most effective alternative for routing outside the Elbe valley. All pilot studies were financed by the regional government of Saxony. This was done in close cooperation with the CZ MoT which represents a Member State and usually deals only with the federal BMVI, i.e. the national level. This constellation shows the high relevance of this infrastructure for the Free State of Saxony and the very close cooperation with the Czech neighbors.

As a consequence of this approach, the preliminary study at hand already includes details of a pre-planning phase. Since 2012 the Free State of Saxony has directly involved the Saxon geologists of the regional authorities (LfULG 2015) to get more detailed knowledge of the geological situation along the new rail line. The detailed involvement of geologists at such an early stage is not the standard approach for the planning of large infrastructure projects in Germany. However, from the geologic survey important aspects have been successfully taken into account in addition to technical and environmental requirements. This procedure enabled the Free State of Saxony to submit this complex project to the BVWP at a very high planning level. This is exceptional, compared to other similar projects in Germany.

6 New rail line Dresden–Prague EGTC

To support the implementation of this project, a European Grouping for Territorial Cohesion (EGTC) was founded in spring 2016 after only a 16 month preparation period. The members are the Czech Republic (represented by the Czech Ministry of Transport), the Free State of Saxony (represented by the Saxon State Ministry of Economic Affairs, Labor and Transport and both border regions – Landkreis Sächsische Schweiz-Osterzgebirge and Ústí Region. Both regions have a strong interest, since they are affected by the current traffic and noise pollution in the Elbe valley and will benefit substantially from the new railway line. The main focus of this EGTC is on public communication and supporting the upcoming planning and permission steps. Involving the regions enables direct contact to the inhabitants to increase acceptance for the project by inclusion of the public in the planning and implementation process.

The EGTC will also play an important coordination role between the decision-makers, the planners and all necessary authorities.

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